An EPA Region 2 GIS Application for Identifying Environmental Justice Areas

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Abstract

The US Environmental Protection Agency's (EPA's) Region 2 office (New York, New Jersey, Puerto Rico, and the US Virgin Islands), has developed a desktop geographic information system (GIS) tool for evaluating environmental justice concerns in a variety of regulatory decisions. The tool was developed according to requirements laid out in a draft regional policy that defines how demographic and environmental data should be used by EPA staff in evaluating environmental justice concerns. The policy's decision criteria define a community as an environmental justice area if (a) minority and/or low-income populations are affected significantly more than those populations in the reference areas, and (b) there is a disproportionate environmental burden on the area compared with the reference areas. The application provides three ways for the analyst to define the boundary of a community and select census block groups within the boundary for detailed examination of demographic characteristics. Boundaries can be predefined, user defined, or created by buffering around selected features. Once the boundary is defined, the percentage of minorities in the area and the percentage of population below poverty level are calculated for the block groups within the boundary, and these values are compared with values for the state and the county. If the relative difference between the community percentages and those of the state/county is greater than 25%, the community boundary is saved as a separate data layer for further comparison with other communities and for analysis of the environmental burden to determine whether it is an environmental justice area. There is no limit on adding other data layers that pertain to the analysis. Health and other available environmental data can be integrated into the application for analysis of correlation between demographic characteristics of communities, community health, and environmental exposure. This application will be widely used within the region as environmental justice concerns become integrated into the daily work of the regional employees.

Keywords: environmental justice, community of concern, relative difference, percent minority, percent population below poverty level

Introduction

Environmental justice is an issue that is of growing importance to the Clinton Administration and to the public. On February 11, 1994, the White House issued Executive Order 12898 on Federal Actions to address environmental justice in minority and low-income populations (1). The order is aimed to "focus federal attention on the environmental and human health conditions in minority communities and low-income communities with the goal of achieving environmental justice." To make achieving

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environmental justice part of its mission at the US Environmental Protection Agency (EPA) Region 2, the office established an Environmental Justice Workgroup on January 12, 1993. The workgroup was charged with providing advice and counsel on justice issues to regional management, and monitoring the progress of the region in achieving the agency's environmental justice goals. The goal of environmental justice is to identify and address unfairness and inconsistency in environmental matters. To address these, EPA Region 2 has developed a draft "Interim Policy on Identifying Environmental Justice Areas" (the "interim policy") (2).

EPA Region 2 Interim Policy

The EPA Region 2 interim policy defines terms, summarizes the steps that are to be taken in preparing for an environmental justice determination, and specifies the decision criteria that are to be used in making the actual determinations. Once an area is determined to be an environmental justice area, subsequent agency actions would be in accordance with established laws, regulations, and policies.

The process described in the policy for determining whether a specific area is subject to the agency's environmental justice program involves five steps:

1. Define the community of concern (COC).
2. Define the reference area.
3. Define the environmental burden.
4. Evaluate the demographic and burden data for the COC and reference areas.
5. Apply the decision criteria to the COC and reference areas.

The five steps center on the comparison of three factors between a COC and one or more reference areas: their respective levels of minority representation, low-income representation, and environmental burden. The screening process determines if a COC is a potential environmental justice area.

For environmental justice purposes, a COC is defined as a low-income community if the percentage of household incomes beneath the poverty level ("percent below poverty level") is significantly greater (25% or more) than in the reference area. A COC is considered a minority community if its percentage of minority residents ("percent minority") is significantly greater (25% or more) than in the reference area.

There is a two-tiered analysis used to identify environmental justice areas:

1. Screening analysis to identify potential environmental justice areas that warrant further study
2. Site-specific analysis to address environmental justice concerns

Environmental justice screening analyses are based primarily on the consideration of demographic data, and focus less on the determination of disproportionate burden. Screening analyses address the demographic characteristics of geographical units within the study area, such as census blocks or block groups, municipalities, or counties. The focus of a screening analysis is on comparison of the demographic characteristics of a discrete geographical community (the COC) with those of a reference area that encompasses the COC.

Site-specific analyses will necessarily be more in-depth than screening analyses because a number of potentially difficult determinations must be made along the way.

First, specific reference areas must be selected, their boundaries delineated, and their demographic data collected. Then, a site-specific analysis requires a detailed analysis of the environmental burden in the COC and reference communities in order to determine whether the burden is disproportionate in the COC.

Overview of the Region 2 Environmental Justice GIS Application

The environmental justice GIS application was developed to support the EPA Region 2 interim policy. In the first stage of development, only the demographic characteristics are incorporated into the application for preliminary screening of potential environmental justice areas. The analysis of disproportionate environmental burden is more complex and will be included in the second stage of application development.

This application enables the analyst to screen for potential environmental justice areas by first comparing the demographic data of the COC with that of the state and county, and then to smaller reference areas.

Two levels of analysis are involved in the screening process: a general screening analysis and a site-specific analysis. To conduct the general screening, first the boundaries of the COC must be defined. Once the boundary of a COC is defined by the user, the application selects the census block groups within the boundary for the evaluation of its demographic characteristics. The COC's percent minority and percent below poverty level are calculated and compared with those of the state and county. If the relative difference between the COC's values and the state/county values is greater than 25%, the COC is then considered a potential environmental justice area and is targeted for more detailed analysis.

In the site-specific analysis, the COC is compared with a smaller reference community. The reference community should be sufficiently close and/or comparable to the COC so that it would be reasonable to assume the presence of similar circumstances if environmental justice were not a factor. Once the boundary of the reference community is defined, the census block groups within the boundary are selected for calculation of percent minority and percent below poverty level. Similar to the general screening, the relative difference between the COC values and the reference community values is evaluated. If the relative difference is more than 25% compared with both state/county and reference areas, the COC is defined as a potential environmental justice area and the COC boundary is saved for further analysis on environmental burden.

The Application

The application starts with index maps of EPA's Region 2, which includes New York, New Jersey, Puerto Rico, and the Virgin Islands. The index map displays the counties in each state. The analyst can choose a county of interest using the "hot link tool" or the "Counties" pull-down menu. A view of the selected county will be created on the fly (Figure 1).

Data layers included in the county view are percent minority, percent below poverty level, municipal boundaries, and county boundaries. All analysis will be done in the county view (Figure 2).

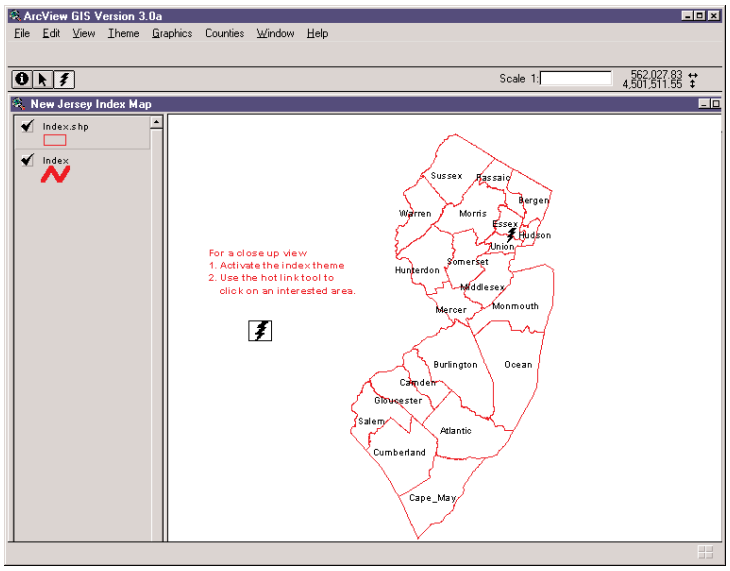

Figure 1 The New Jersey index map.

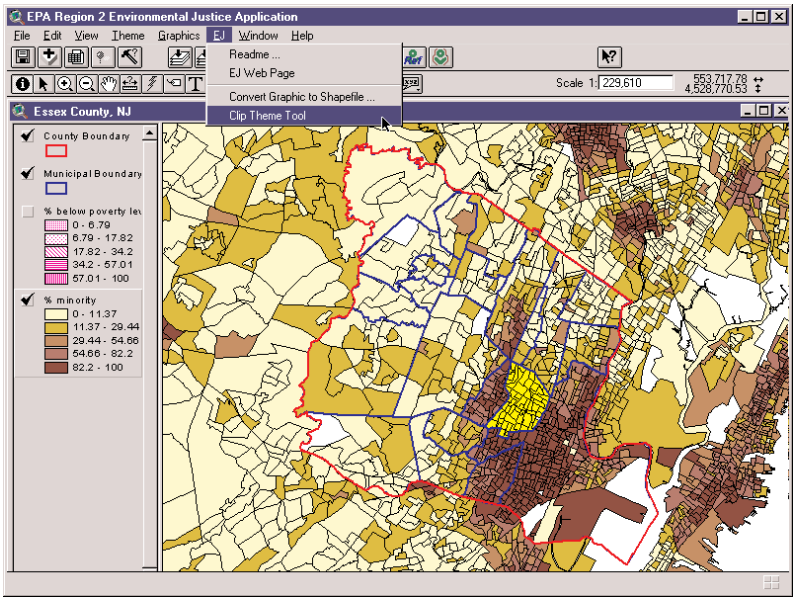

Figure 2 The county view.

The Screening Procedures

1. Define the boundary of a COC.
2. Select the census block groups within the boundary and convert into a new theme.
3. Calculate the percent minority and percent below poverty level for the COC,

and compare the relative difference between the COC's values and those of the state/county.

Defining the Boundary of a Community of Concern

There are three ways to enable the analyst to define the boundary. They are as follows:

- Using the customized "S" button to select a municipality (Figure 3).
- Using ArcView's "Graphic Tool" to draw a user-defined boundary (Figure 4).
- Using the customized "Buffer Tool" to create a buffer as the boundary (Figure 5).

The "S" button can be used to select the census block groups within a pre-defined boundary. The "S" button performs a theme-on-theme selection and for this application, the two themes used are municipality boundary and percent minority. This can be modified to be used on any pre-defined boundary.

The "Graphic Tool," when used together with the "Convert Graphic to Shapefile" and "Clip Theme Tool," will provide the flexibility to create any boundaries defined by users (Figure 6). The user can simply draw the boundary of the COC on the view with the "Graphic Tool," then convert the graphic into a theme with "Convert Graphic to Shapefile." Once a theme of the boundary is created, "Clip Theme Tool" is used to select the census block groups that fall within the boundary. Some block groups may be clipped by the COC boundary so that a portion of the block group lies within the COC boundary and a portion lies outside of the boundary. In this case, the numerical values

Figure 3 The "S" (select) button.

Figure 4 The Graphic Tool.

Figure 5 The Buffer Tool.

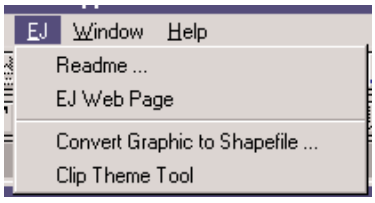

Figure 6 "Convert to Graphic" and "Clip Theme Tool" menu.

in the attribute table for block groups are updated based on the percentage of the block group area that falls within the COC boundary.

The "Buffer Tool" provides a way for users to find out the demographic characteristics around a facility. First, a buffer of one or more facilities is created and, similar to the "Graphic Tool" method, the buffer is used for clipping the census block groups. Once the census block groups within the boundary are identified, percent minority and percent below poverty level can be calculated.

Comparison of the Relative Difference between the COC and the State/County

There is a built-in function that calculates the relative difference between the COC values and the state/county values. The formulas for calculating the relative difference are as follows:

Relative difference between percent minority values:

{[(% minority in the COC) – (% minority in the reference community)] / % minority in the reference community} x 100

Relative difference between percent below poverty line values:

{[(% below poverty level in the COC) – (% below poverty level in the reference community)] / % below poverty level in the reference community} x 100

Once the census block groups within the boundary of a COC are identified, the analyst can click on the "S/C" button. The percent minority and percent below poverty level in the COC, the state, and the county and also their relative differences will be calculated and the results will be displayed. The analyst can save these statistics to a table or dismiss the window without saving (Figure 7).

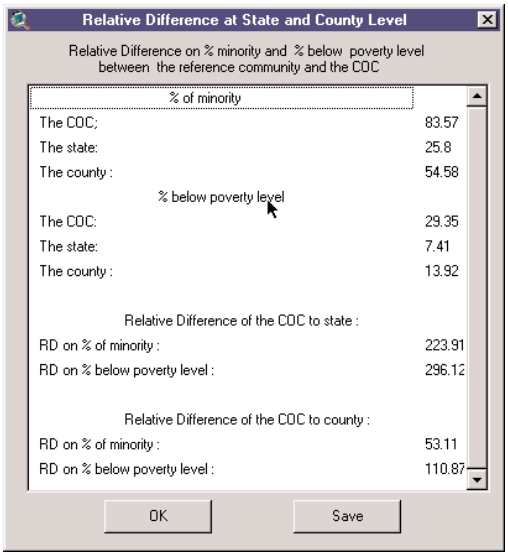

Figure 7 Relative difference between the community of concern and the state/county.

Site-Specific Analysis

Once a general screening identifies a COC as a potential environmental justice area, the community is subjected to site-specific analysis. The COC is compared with one or more reference communities. In a site-specific analysis, the reference areas should be sufficiently close and/or comparable to the COC so that it would be reasonable to assume the presence of similar circumstances if environmental justice were not a factor. For example, in our pilot study we compared Greenpoint/Williamsburg in Brooklyn, New York, the proposed site of a USA Waste transfer station, to all other New York City communities near waste transfer stations. Greenpoint/Williamsburg is the COC and the other New York City communities are the reference areas. Selection of reference communities is case specific and has to be justified by the analyst. However, once the reference community is selected, the way in which reference area boundaries are defined is similar to the way a COC is defined. Similar to the general screening, the "Ref" button will calculate and display the demographic data of the COC and the reference area. If the relative difference between the COC levels and the reference area levels is greater than 25%, the COC will be saved for further analysis on environmental burden (Figure 8).

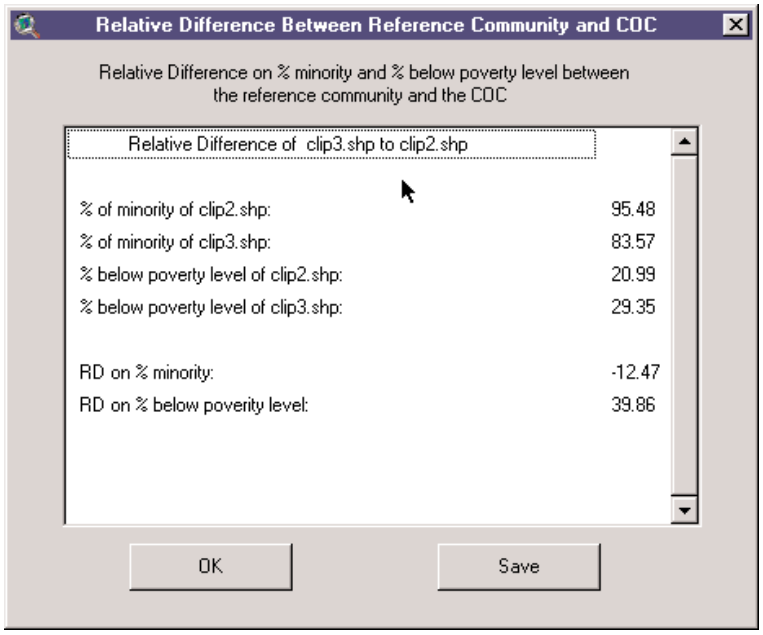

Figure 8 Relative difference between the community of concern and the reference community.

Conclusion

To achieve the goal of environmental justice, EPA Region 2 established the Environmental Justice Workgroup to provide advice and counsel on justice issues. The Environmental Justice GIS Application was developed to provide an easier way for the workgroup to identify areas of high minority or low-income representation that may suffer from disproportionate environmental burden. In this version, analysis

involves only the demographic data; environmental burden has not been addressed, as more research on methods in assessing the environmental burden is needed. Currently, EPA Region 2 is conducting a number of pilot studies using the application to screen for potential environmental justice areas. This application will be widely used within Region 2 as environmental justice becomes integrated into the daily work of the regional employees.

Although this application is developed for assessment of environmental justice, it can be easily modified for other purposes. There is no limit on adding other data layers that pertain to an environmental justice analysis. Health and other available environmental data can be integrated into the application for analysis of correlation between demographic characteristics of communities, community health, and environmental exposure.

References

1. The White House. 1994. *Executive order on federal actions to address environmental justice in minority populations and low-income populations.* Executive Order 12898. Washington, DC: The White House. 11 February.
2. USEPA Region 2. 1997. *Draft implementation guidance to the interim USEPA Region 2 policy on identifying environmental justice areas.* New York: US Environmental Protection Agency.